The only official copy of this file is the one on-line on the Superconducting Magnet Division website. Before using a printed copy, verify that it is the most current version by checking the document issue date on the website.

SMD
Magnet Division Procedure

Proc. No.: LHC-MAG-R-1051

Issue Date: January 8, 2002

Rev. No.: D

Rev. Date: June 12, 2003

Title: LHC Electrical Testing of Level & Temperature Sensors

- Prepared by: Signature on File
- Cognizant Engineer: Signature on File
- LHC Project Engineer: Signature on File
- Electrical Engineer: Signature on File
- Production Section Head: Signature on File
- Q. A. Approval: Signature on File
- ES&H Review: Signature on File

REVISION RECORD

Rev. No.	Date	Page	Subject	Approval
A	1/8/02		Initial Release	
B	8/19/02		Changes per ECN #MG2103	
C	2/20/03		Changes per ECN #MG2124	
D	6/12/03		Changes per ECN #MG2140	

1 Scope:

This specification establishes the procedure for testing Liquid Helium Level Sensors and Cryogenic Thermometer Assemblies used in LHC magnets.

2 Applicable Documents:

The following documents, in effect on the date of issue of this specification, form a part of this specification:

RHIC-MAG-Q-1000	Control of Measurement Test Equipment
RHIC-MAG-Q-1004	Discrepancy Reporting Procedure
14010222	Liquid Helium Level Sensor
14010235	Cryogenic Thermometer Assemblies

3 Requirements:

3.1 Material/Equipment

Digital Volt Meter - Capable of "4 Wire" Resistance Measurement. Maximum resistance (or O.L. - "Over Load") - 20 Megohms or greater.

3.2 Safety Precautions

N/A

3.3 Procedure

3.3.1 Level Probe Electrical Check

CAUTION

To avoid possible damage to the probe, do not exceed manufacturers voltage & current limits while testing

A) Perform resistance check between I & V leads of each sensor. Verify readings are within ranges noted in table 1.

B) Perform resistance test of each level probe & lead wire combination to ground. Resistance to be > 20MΩ.

Table 1 - Level Sensor Probe Resistance Values

D2/D4 Level Probes				
			Probe Part No.	
Sensor Function	**Standard Leads**	**Phosphor Bronze Leads**	**14010222-01**	**14010222-02**
			Range (Ω)	**Range (Ω)**
$I^- \leftrightarrow V^-$	Black ↔ Yellow	Navy Blue ↔ Clear	34.0 – 53.0	103.0 - 129.0
$I^+ \leftrightarrow V^+$	Red ↔ Blue	Red ↔ Green		
$I^- \leftrightarrow V^+$	Black ↔ Blue	Navy Blue ↔ Green	285.0 - 311.0	354.0 - 383.0
$I^+ \leftrightarrow V^-$	Red ↔ Yellow	Red ↔ Clear		

D3 Level Probes		
		Probe Part No.
Sensor Function	**Lead Color**	**14010546**
		Range (Ω)
$I^- \leftrightarrow V^-$	Black ↔ Yellow	12.0 – 15.0
$I^+ \leftrightarrow V^+$	Red ↔ Blue	17.0 - 21.0
$I^- \leftrightarrow I^+$	Black ↔ Red	127.0 - 161.0
$V^+ \leftrightarrow V^-$	Blue ↔ Yellow	

3.3.2 Temperature Sensor Electrical Check

CAUTION

To avoid possible damage to the sensor, do not exceed manufacturers voltage & current limits while testing

A) Perform resistance checks as noted in table 2. Verify readings are within ranges noted in table.

B) Perform resistance test of each sensor & lead wire combination to ground. Resistance to be > 20MΩ.

Table 2 - Temperature Sensor Resistance Values		
	Lead Color	**Range (Ω)**
R (U^+, U^-, I^+, I^-)		60.0 -70.0
R (U^-, I^-)	Red ↔ Green	5.8 - 8.8
R (U^+, I^+)	Black ↔ Yellow	

C) After completing measurements, short the leads of each sensor by twisting its wires together. Insulate from ground. Do this for each sensor independently.

4 Quality Assurance Provisions:

4.1 The Quality Assurance provisions of this procedure require that the technician shall be responsible for performing all assembly operations in compliance with the procedural instructions contained herein and the recording of the results on the production traveler.

4.2 The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported in accordance with RHIC- MAG-Q-1004.

4.3 Measuring and test equipment used for this procedure shall contain a valid calibration label in accordance with RHIC-MAG-Q-1000.

5 Preparation for Delivery:

N/A